Could *Myotis daubentonii* be considered as a bioindicator species?

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Framework & aims

Myotis daubentonii (Daubenton's bat) is a chiropter of Vespertilionidae family with a wide distribution along Europe *(Fig.1)*.

- 90s: National Bat Monitoring Program (UK) → Daubenton's bat monitorings.
- 2007: QuiroRius, Natural Science Museum of Granollers adaptation NBMP in Catalonia.

Myotis daubentonii = bioindicator?

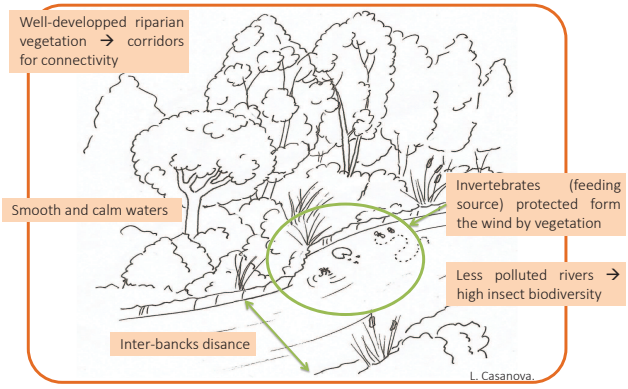
- Population rapidly declines → slow reproductive rates
- Diet specialist (key ecosystem service → controlling arthropod and insect populations)

- Generalist specie
- Abundance ↑ in channelized and eutrophicated waters

Jones et al., 2009; Barlow et al., 2015.

Fig. 1 Distribution of *M. daubentonii*. www.eurobats.org.

Daubenton's bat habitat requirements



Methodology

Study site: 20 different sampling sections of Catalan rivers (north-eastern Iberian Peninsula). Every section had 4 monitoring points.*(Fig..2)*.

River characteristics: depth, wide, section and water speed.

Bioindicator indexes

- **Bat activity**: (QuiroRius) Counting sessions during 40 min. in a 1 km transect. Data: bat passes /min.
- **Macroinvertebrates**: data obtained according to IBMWP (Iberian Biological Monitoring Working Party) protocol.
- **Riaprian vegetation** QBR index (index of Riparian Quality) = total riparian cover + cover structure, + cover quality +river channel naturalness. Evaluate quality of riparian forests.

Statistical analysis

- Wilcoxon test: differences between the presence and absence of bats for each variables.
- Spearman's rank order correlations between bat activity and QBR and IBMWP.
- Logistic model.
- GLMM.

Fig. 2. Example of sampling site.

Main aim

To asses if *M. daubentonii* is playing the role of bioindicator species of the riparian habitat and river quality in the Mediterranean region

Specific aims

- Effect of the structural characteristics of the river upon bat activity
- Effect of insect availability upon bat activity
- Effect of riparian forest qualiy upon bat activity

Results

M. daubentonii prefers deep and slow waters (p<0.005, x^2 7.995, n=25).

Daubenton's bat activity did no show relation to IBMWP.

Differences on QBR were high significant where Daubenton's bats were detected (p<0.005, W 388, n=78) *(Fig. 3)*.

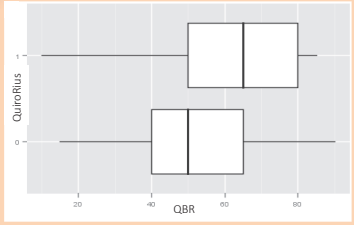


Fig. 3. Box plot between Index of Riparian Quality (QBR) and presence (1) or absence (0) of M. daubentonii *(QuiroRius). Median + box (Q1, Q3) + whisker (min,max)*

Logistic model showed that each QBR unit made increase a 4% of the bat presence *Odds ratio (Fig. 4)*.

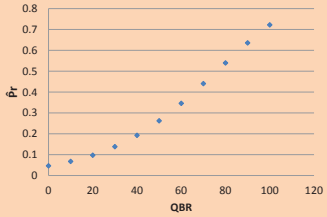


Fig. 4. Probability of bat presence (Pr) according to the index of Riparian Quality (QBR).

GLMM

To study the effect of the environmental variables the best fitted model (Akaike Information Criterion) was used *(Fig. 5)*.

Bat activity = total riparian cover + structure cover + river water speed + river width

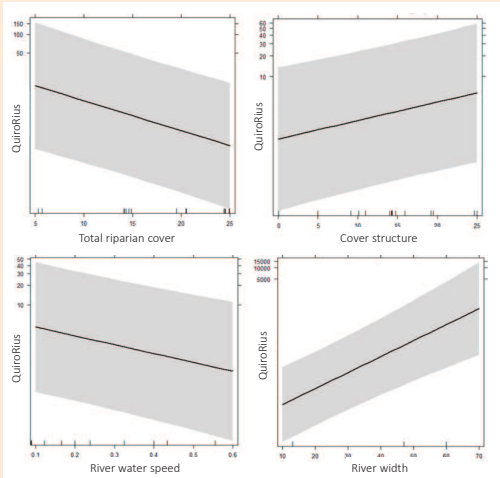


Fig.5. Effect of each predictor variable considered in the GLMM. Each variable has been properly balanced with the effect of the rest variables considered in the model.

Discussion

- Insect protection
- Tree lines are considered navigational aids for commuting bats

- Preference for >10m inter-bank distances rather than narrow channels

Cover structure
River width

Bat abundance (+ / -)

Total riparian cover
River water speed

- Difficulty to forage ↑
- High speed ↑ difficulty to capture insects
- Insect availability ↓

IBMWP index does not consider the flying adults which are the majority of feeding resources for bats.

Biscardi et al., 2007; Ober et al., 2008.

Conclusion

- Positive selection to smooth waters and well developed riparian vegetation.
- Invertebrate – bat activity relationship should be further studied and measured with another specific methodology.
- Relative *M. daubentonii* abundance is driven by total riparian cover, cover structure, river water speed and river width.
- Information from QuiroRius and QBR are highly correlated.
- QuiroRius could be used as a complementary bioindicator.
- Information collected will help us to detect changes in bat populations.

Myotis daubentonii.

References: Barlow, K.E., Briggs, P.A., Haysom, K.A., Hutson, A.M., Lechiara, N.L., Racey, P.A., Walsh, A.L., Langton, S.D., 2015. Biological Conservation, 182, 14-26. Biscardi, S., Russo, D., Casciani, V., Cesarini, D., Mei, M.,. Boitani, L., 2007. Journal of Zoology, 273, 372-81. Jones, G., Jacobs, D.S., Kunz, T.H., Willing, M.R., Racey, P.A., 2009. Endangered Species Research, 8, 93-115. Ober, H.K., Hayes, J.P., 2008. Journal of Wildlife Management, 72, 396-404. Images: © Oriol Massana Valeriano, Adrià López-Baucells.